



# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## General Description

The MAX6701–MAX6708 microprocessor (µP) supervisory circuits reduce the complexity and components required to monitor power-supply functions in µP systems. These devices significantly improve system reliability and accuracy compared to separate ICs or discrete components.

The MAX6701–MAX6708 family provides four functions: a reset output during power-up, power-down and brownout conditions; an independent watchdog output that goes low if the watchdog input has not been toggled within 1.6s; a 0.62V threshold detector for power-fail warning; and an active-low manual reset input.

The MAX6701–MAX6708 family offers several pinout options to accommodate a variety of multivoltage microprocessor supervision applications.

The MAX6701/MAX6702/MAX6703 monitor three supply voltages (one fixed threshold and two adjustable) to drive a single reset output and include a manual reset input and a watchdog timer with an independent output. The MAX6704 monitors a single supply voltage to drive complementary reset outputs and includes an independent adjustable power fail in/power fail out comparator, a manual reset input, and a reset based watchdog timer. The MAX6705/MAX6706/MAX6707 monitor a single supply voltage to drive a single reset output and include an independent adjustable power fail in/power fail out comparator, a manual reset input, and a watchdog timer with an independent output. The MAX6708 is the same as the MAX6704 but without the watchdog timer function.

## Applications

Computers  
Controllers  
Intelligent Instruments  
Automotive Systems  
Critical µP Power Monitoring  
White Goods  
Networking  
Telecommunications

*Typical Operating Circuit appears at end of data sheet.*

## Features

- ◆ Small 8-Pin SOT23 Package
- ◆ Precision Monitoring of +5.0V, +3.3V, +3.0V, +2.5V Supply Voltages
- ◆ 140ms Reset Timeout Delay
- ◆ Power Fail Input with Independent Output; Monitors Inputs Down to 0.62V (MAX6704–MAX6708)
- ◆ Dual Adjustable Reset Input for Triple Voltage Monitoring (MAX6701/MAX6702/MAX6703)
- ◆ 1.6s Watchdog Timeout Period (MAX6701–MAX6707)
- ◆ Independent Watchdog Output (MAX6701/MAX6702/MAX6703/MAX6705/MAX6706/MAX6707)
- ◆ Manual Reset Input
- ◆ Four Reset Output Stage Options
  - Active-Low Push-Pull (MAX6701, MAX6705)
  - Active-Low Open-Drain (MAX6703, MAX6707)
  - Active-High Push-Pull (MAX6702, MAX6706)
  - Dual Active-Low/High Push-Pull (MAX6704, MAX6708)
- ◆ Guaranteed Reset Valid to V<sub>CC</sub> = 1V
- ◆ Immune to Short Negative V<sub>CC</sub> Transients
- ◆ Low Cost, Few External Components

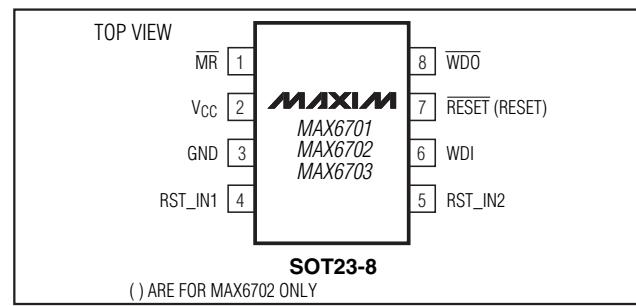
## Ordering Information

| PART                | TEMP. RANGE     | PIN-PACKAGE |
|---------------------|-----------------|-------------|
| <b>MAX6701_KA-T</b> | -40°C to +125°C | SOT23-8     |
| <b>MAX6702_KA-T</b> | -40°C to +125°C | SOT23-8     |
| <b>MAX6703_KA-T</b> | -40°C to +125°C | SOT23-8     |

Insert the desired suffix letter (from the Threshold Suffix Guide table) into the blank to complete the part number. All devices must be ordered in increments of 2500 pieces. Sample stock is typically held on standard versions only. Contact factory for availability.

*Ordering Information continued at end of data sheet.*

## Pin Configurations



*Pin Configurations continued at end of data sheet.*



**MAX6701–MAX6708**

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## ABSOLUTE MAXIMUM RATINGS

|   |                                   |
|---|-----------------------------------|
| V <sub>CC</sub> .....                         | -0.3V to +6.0V                    |
| Open-Drain RESET, WDO, PFO .....              | -0.3V to +6.0V                    |
| Push-Pull RESET, RESET, WDO, PFO .....        | -0.3V to (V <sub>CC</sub> + 0.3V) |
| MR, WDI, PFI, RST_IN1, RST_IN2 .....          | -0.3V to (V <sub>CC</sub> + 0.3V) |
| Input Current (V <sub>CC</sub> ) .....        | 20mA                              |
| Output Current (RESET, RESET, PFO, WDO) ..... | 20mA                              |

|   |                 |
|---|-----------------|
| Continuous Power Dissipation (T <sub>A</sub> = +70°C) |                 |
| 8-Pin SOT23 (derate 8.9mW/°C above +70°C) .....       | 714mW           |
| Operating Temperature Range .....                     | -40°C to +125°C |
| Junction Temperature .....                            | +150°C          |
| Storage Temperature Range .....                       | -65°C to +150°C |
| Lead Temperature (soldering, 10s) .....               | +300°C          |

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = +4.25V to +5.5V for L/M versions, V<sub>CC</sub> = +2.55V to +3.6V for the T/S/R versions, V<sub>CC</sub> = +2.1V to +2.75V for the Z/Y versions. T<sub>A</sub> = -40°C to +125°C, unless otherwise specified. Typical values are at T<sub>A</sub> = +25°C.) (Note 1)

| PARAMETER  | SYMBOL           | CONDITIONS                                     | MIN                              | TYP  | MAX  | UNITS  |
|--|------------------|--|----------------------------------|------|------|--------|
| Operating Voltage Range                                      | V <sub>CC</sub>  | T <sub>A</sub> = 0°C to +125°C                 | 1.0                              | 5.5  |      | V      |
|  |                  | T <sub>A</sub> = -40°C to +125°C               | 1.2                              | 5.5  |      |        |
| Supply Current<br>MR Unconnected                             | I <sub>CC</sub>  | V <sub>CC</sub> < 5.5V, no load                |                                  | 12   | 25   | µA     |
|  |                  | V <sub>CC</sub> < 3.6V, no load                |                                  | 9    | 20   |        |
|  |                  | V <sub>CC</sub> < 3.6V, no load (MAX6708 only) |                                  | 6    | 20   |        |
| V <sub>CC</sub> Reset Threshold<br>(V <sub>CC</sub> falling) | V <sub>TH</sub>  | MAX670_L                                       | T <sub>A</sub> = -40°C to +85°C  | 4.50 | 4.63 | 4.75   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 4.47 |      | 4.78   |
|  |                  | MAX670_M                                       | T <sub>A</sub> = -40°C to +85°C  | 4.25 | 4.38 | 4.50   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 4.22 |      | 4.53   |
|  |                  | MAX670_T                                       | T <sub>A</sub> = -40°C to +85°C  | 3.00 | 3.08 | 3.15   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 2.97 |      | 3.17   |
|  |                  | MAX670_S                                       | T <sub>A</sub> = -40°C to +85°C  | 2.85 | 2.93 | 3.00   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 2.83 |      | 3.02   |
|  |                  | MAX670_R                                       | T <sub>A</sub> = -40°C to +85°C  | 2.55 | 2.63 | 2.70   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 2.53 |      | 2.72   |
|  |                  | MAX670_Z                                       | T <sub>A</sub> = -40°C to +85°C  | 2.25 | 2.32 | 2.38   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 2.24 |      | 2.40   |
|  |                  | MAX670_Y                                       | T <sub>A</sub> = -40°C to +85°C  | 2.12 | 2.19 | 2.25   |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 2.11 |      | 2.27   |
| Reset Threshold Temperature Coefficient                      | ΔV <sub>TH</sub> |  |                                  | 60   |      | ppm/°C |
| V <sub>CC</sub> to Reset Output Delay                        |                  | V <sub>CC</sub> falling at 10mV/µs             |                                  | 12   |      | µs     |
| Reset Timeout Period   | t <sub>RP</sub>  |  | T <sub>A</sub> = -40°C to +85°C  | 140  | 200  | 280    |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 120  |      | 300    |
| PFI, RST_IN1, RST_IN2 Threshold                              |                  | V <sub>CC</sub> = 1.8V to 5.5V                 | T <sub>A</sub> = -40°C to +85°C  | 602  | 618  | 634    |
|  |                  |  | T <sub>A</sub> = -40°C to +125°C | 593  |      | 642    |
| PFI, RST_IN1, RST_IN2 Hysteresis                             |                  |  |                                  | 6    |      | mV     |

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## ELECTRICAL CHARACTERISTICS (continued)

( $V_{CC} = +4.25V$  to  $+5.5V$  for L/M versions,  $V_{CC} = +2.55V$  to  $+3.6V$  for the T/S/R versions,  $V_{CC} = +2.1V$  to  $+2.75V$  for the Z/Y versions.  $T_A = -40^\circ C$  to  $+125^\circ C$ , unless otherwise specified. Typical values are at  $T_A = +25^\circ C$ .) (Note 1)

| PARAMETER  | SYMBOL    | CONDITIONS  | MIN                                   | TYP                   | MAX                 | UNITS |  |
|--|-----------|---|---------------------------------------|-----------------------|---------------------|-------|--|
| PFI, RST_IN1, RST_IN2 Leakage Current                |           | (Note 2)  | $T_A = -40^\circ C$ to $+85^\circ C$  | -50                   | +50                 | nA    |  |
| PFI to PFO Delay                                     |           |   | $T_A = -40^\circ C$ to $+125^\circ C$ | -200                  | +200                |       |  |
| MR Input Voltage                                     | $t_{PF}$  |   |                                       |                       | 1                   | µs    |  |
| MR Minimum Input Pulse                               | $V_{IL}$  |   |                                       |                       | $0.3 \times V_{CC}$ | V     |  |
|  | $V_{IH}$  |   |                                       |                       | $0.7 \times V_{CC}$ |       |  |
| MR Glitch Rejection                                  |           |   |                                       |                       | 1                   | µs    |  |
| MR to Reset Delay                                    | $t_{MD}$  |   |                                       |                       | 100                 | ns    |  |
| MR Pullup Resistance                                 |           |   |                                       |                       | 200                 | ns    |  |
| Watchdog Timeout Period                              | $t_{WD}$  | $T_A = -40^\circ C$ to $+85^\circ C$  |                                       | 25                    | 50                  | 75    |  |
| WDI Pulse Width                                      |           | $T_A = -40^\circ C$ to $+125^\circ C$   |                                       | 1.12                  | 1.6                 | 2.4   |  |
| WDI Input Voltage                                    |           | $t_{WDI}$ (Note 2)  |                                       | 0.96                  | 2.52                | s     |  |
| WDI Input Current                                    |           | $V_{IL}$  |                                       | $WDI = 0$ or $V_{CC}$ |                     |       |  |
| RESET, WDO, PFO Output Low (Push-Pull or Open-Drain) | $V_{OL}$  | $V_{CC} \geq 1.0V$ , $I_{SINK} = 50\mu A$ , output asserted ( $T_A = 0^\circ C$ to $+125^\circ C$ ) |                                       | 0.3                   |                     | V     |  |
|  |           | $V_{CC} \geq 1.2V$ , $I_{SINK} = 100\mu A$ , output asserted  |                                       | 0.3                   |                     |       |  |
|  |           | $V_{CC} \geq 2.55V$ , $I_{SINK} = 1.2mA$ , output asserted  |                                       | 0.3                   |                     |       |  |
|  |           | $V_{CC} \geq 4.25V$ , $I_{SINK} = 3.2mA$ , output asserted  |                                       | 0.4                   |                     |       |  |
| PFO Output Low (Push-Pull or Open-Drain)             | $V_{OL}$  | $V_{CC} \geq 1.80V$ , $I_{SINK} = 200\mu A$ , output asserted                                       |                                       | 0.3                   |                     | V     |  |
|  |           | $V_{CC} \geq 2.55V$ , $I_{SINK} = 1.2mA$ , output asserted  |                                       | 0.3                   |                     |       |  |
|  |           | $V_{CC} \geq 4.25V$ , $I_{SINK} = 3.2mA$ , output asserted  |                                       | 0.4                   |                     |       |  |
| RESET, WDO, PFO Output High (Push-Pull Only)         | $V_{OH}$  | $V_{CC} \geq 2.7V$ , $I_{SINK} = 500\mu A$ , output not asserted                                    |                                       | $0.8 \times V_{CC}$   |                     | V     |  |
|  |           | $V_{CC} \geq 4.75V$ , $I_{SINK} = 800\mu A$ , output not asserted                                   |                                       | $0.8 \times V_{CC}$   |                     |       |  |
| RESET, WDO, PFO Output Open-Drain Leakage Current    | $I_{LKG}$ | $V_{CC} > V_{TH}$ , output not asserted   |                                       | 1.0                   |                     | µA    |  |
| RESET Output High (Push-Pull Only)                   | $V_{OH}$  | $V_{CC} \geq 1.0V$ , $I_{SOURCE} = 1\mu A$ , reset asserted ( $T_A = 0^\circ C$ to $+125^\circ C$ ) |                                       | $0.8 \times V_{CC}$   |                     | V     |  |
|  |           | $V_{CC} \geq 1.2V$ , $I_{SOURCE} = 50\mu A$ , reset asserted  |                                       | $0.8 \times V_{CC}$   |                     |       |  |
|  |           | $V_{CC} \geq 2.55V$ , $I_{SOURCE} = 500\mu A$ , reset asserted                                      |                                       | $0.8 \times V_{CC}$   |                     |       |  |
|  |           | $V_{CC} \geq 4.25V$ , $I_{SOURCE} = 800\mu A$ , reset asserted                                      |                                       | $0.8 \times V_{CC}$   |                     |       |  |

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## ELECTRICAL CHARACTERISTICS (continued)

( $V_{CC} = +4.25V$  to  $+5.5V$  for L/M versions,  $V_{CC} = +2.5V$  to  $+3.6V$  for the T/S/R versions,  $V_{CC} = +2.1V$  to  $+2.75V$  for the Z/Y versions.  $T_A = -40^\circ C$  to  $+125^\circ C$ , unless otherwise specified. Typical values are at  $T_A = +25^\circ C$ .) (Note 1)

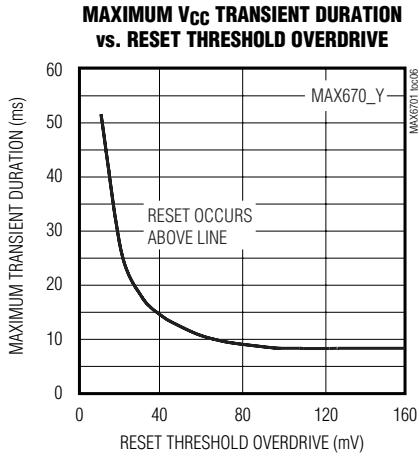
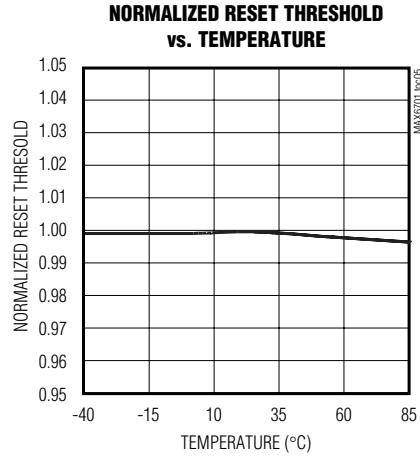
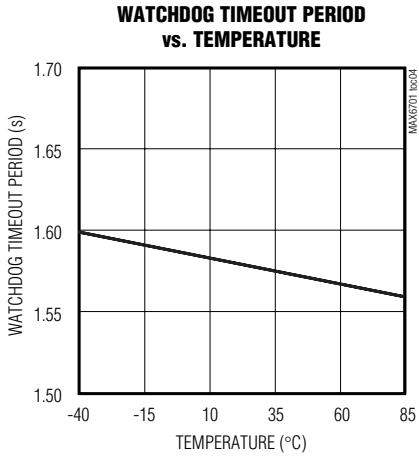
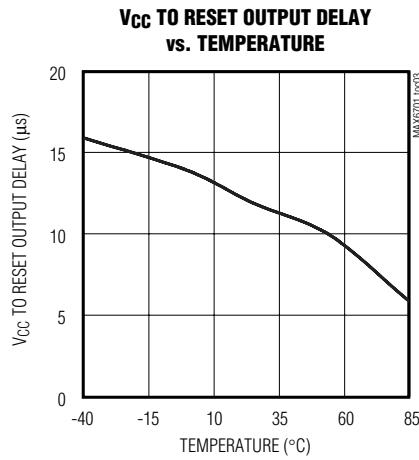
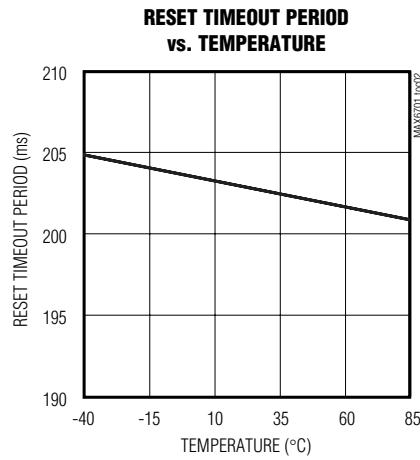
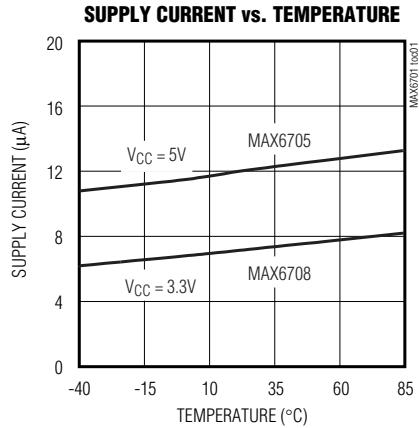
| PARAMETER                         | SYMBOL   | CONDITIONS  | MIN | TYP | MAX | UNITS |
|-----------------------------------|----------|---|-----|-----|-----|-------|
| RESET Output Low (Push-Pull Only) | $V_{OL}$ | $V_{CC} \geq 2.7V$ , $I_{SINK} = 1.2mA$ , reset not asserted  |     |     | 0.3 | V     |
|                                   |          | $V_{CC} \geq 4.75V$ , $I_{SINK} = 3.2mA$ , reset not asserted |     |     | 0.4 |       |

Note 1: Over temperature limits are guaranteed by design and not production tested. Devices are tested at  $T_A = +25^\circ C$ .

Note 2: Guaranteed by design. Not production tested.

## Typical Operating Characteristics

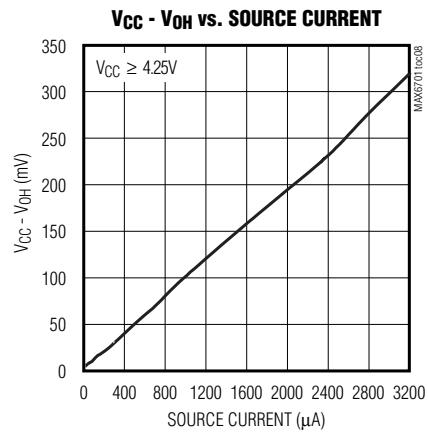
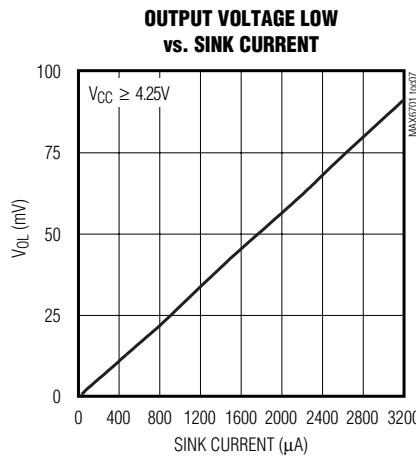
( $T_A = +25^\circ C$ , unless otherwise noted.)



# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## Typical Operating Characteristics (continued)

( $T_A = +25^\circ\text{C}$ , unless otherwise noted.)



## Pin Description

| MAX6701<br>MAX6702<br>MAX6703 | MAX6704 | MAX6705<br>MAX6706<br>MAX6707 | MAX6708 | NAME                    | FUNCTION   |
|-------------------------------|---------|-------------------------------|---------|-------------------------|--|
| 1                             | 1       | 1                             | 1       | $\overline{\text{MR}}$  | Active-Low, Manual Reset Input, Internal 50k $\Omega$ Pullup to V <sub>CC</sub> . Pull low to force a reset. Reset remains active as long as $\overline{\text{MR}}$ is low and for the reset timeout period after $\overline{\text{MR}}$ goes high. Leave unconnected or connect to V <sub>CC</sub> if unused.   |
| 2                             | 2       | 2                             | 2       | V <sub>CC</sub>         | Supply Voltage for MAX6701–MAX6708 and Input for Primary Reset Threshold Monitor. Push-pull outputs are powered by V <sub>CC</sub> .   |
| 3                             | 3       | 3                             | 3       | GND                     | Ground   |
| —                             | 4       | 4                             | 4       | PFI                     | Power Fail Voltage Monitor Input. High-impedance input for internal power fail comparator. Connect this pin to an external resistive divider network to set the reset threshold voltage; 0.62V (typ) threshold. Connect to GND or V <sub>CC</sub> when not used.   |
| —                             | 5       | 5                             | 5       | $\overline{\text{PFO}}$ | Power Fail Monitor Output. Open-drain or push-pull active-low. $\overline{\text{PFO}}$ goes low when PFI is less than 0.62V.   |
| 6                             | 6       | 6                             | —       | WDI                     | Watchdog Input. If WDI remains high or low for longer than the watchdog timeout period, the internal watchdog timer runs out and WDO is asserted on the MAX6704 (resets are asserted for the reset timeout period). The internal watchdog timer clears whenever reset is asserted, or WDI sees a rising or falling edge. The watchdog function cannot be disabled. |
| —                             | —       | —                             | 6       | N.C.                    | No Connection  |

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## Pin Description (continued)

| MAX6701<br>MAX6702<br>MAX6703 | MAX6704 | MAX6705<br>MAX6706<br>MAX6707 | MAX6708 | NAME    | FUNCTION   |
|-------------------------------|---------|-------------------------------|---------|---------|--|
| 7                             | 7       | 7                             | 7       | RESET   | Active-Low Reset Output (Open-Drain or Push-Pull). <u>RESET</u> changes from high to low when the <u>V<sub>CC</sub></u> input drops below the selected reset threshold (or <u>RST_IN1</u> / <u>RST_IN2</u> for the MAX6701/MAX6702/MAX6703), <u>MR</u> is pulled low, or the watchdog triggers a reset (MAX6704 only). <u>RESET</u> remains low for the reset timeout period after the reset conditions are terminated.                                |
| 8                             | —       | 8                             | —       | WDO     | Active-Low Watchdog Output (Open-Drain or Push-Pull). <u>WDO</u> is asserted whenever the watchdog times out and does not deassert until the watchdog is cleared. <u>WDO</u> also asserts when <u>V<sub>CC</sub></u> or <u>RST_IN_</u> are below reset thresholds or <u>MR</u> is pulled low. <u>WDO</u> deasserts after a valid <u>WDI</u> transition (without a reset timeout period).   |
| 7*                            | 8       | 7*                            | 8       | RESET   | Active-High Reset Output (Push-Pull). <u>RESET</u> changes from low to high when the <u>V<sub>CC</sub></u> input drops below the selected reset threshold (or <u>RST_IN1</u> / <u>RST_IN2</u> for MAX6701/MAX6702/MAX6703), <u>MR</u> is pulled low, or the watchdog triggers a reset (MAX6704 only). <u>RESET</u> remains high for the reset timeout period after the reset conditions are terminated.<br>*RESET active-high for the MAX6702/MAX6706. |
| 4                             | —       | —                             | —       | RST_IN1 | Input for User Adjustable <u>V<sub>CC2</sub></u> Monitor. High-impedance input for second internal reset comparator. Connect this pin to an external resistive-divider network to set the reset threshold voltage; 0.62V (typ) threshold. Connect to <u>V<sub>CC</sub></u> when not used. Reset is asserted when either <u>V<sub>CC</sub></u> , <u>RST_IN1</u> , or <u>RST_IN2</u> are below threshold.  |
| 5                             | —       | —                             | —       | RST_IN2 | Input for User Adjustable <u>V<sub>CC3</sub></u> Monitor. High-impedance input for third internal reset comparator. Connect this pin to an external resistive-divider network to set the reset threshold voltage; 0.62V (typ) threshold. Connect to <u>V<sub>CC</sub></u> when not used. Reset is asserted when either <u>V<sub>CC</sub></u> , <u>RST_IN1</u> , or <u>RST_IN2</u> are below threshold.   |

## Detailed Description

### Reset Output

A microprocessor's (µP's) reset input starts the µP in a known state. The MAX6701–MAX6708 assert reset during power-up and prevent code execution errors during power-down or brownout conditions.

On power-up, once V<sub>CC</sub> reaches 1V, RESET is a guaranteed logic low of 0.4V or less. As V<sub>CC</sub> rises, RESET

stays low. After V<sub>CC</sub> rises above the reset threshold, an internal timer holds RESET low for about 200ms. RESET pulses low whenever V<sub>CC</sub> dips below the reset threshold, including brownout conditions. If a brownout occurs in the middle of a previously initiated reset pulse, the pulse continues for at least another 140ms. On power-down, once V<sub>CC</sub> falls below the reset threshold, RESET stays low and is guaranteed to be 0.4V or less, until V<sub>CC</sub> drops below 1V.

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

**MAX6701-MAX6708**

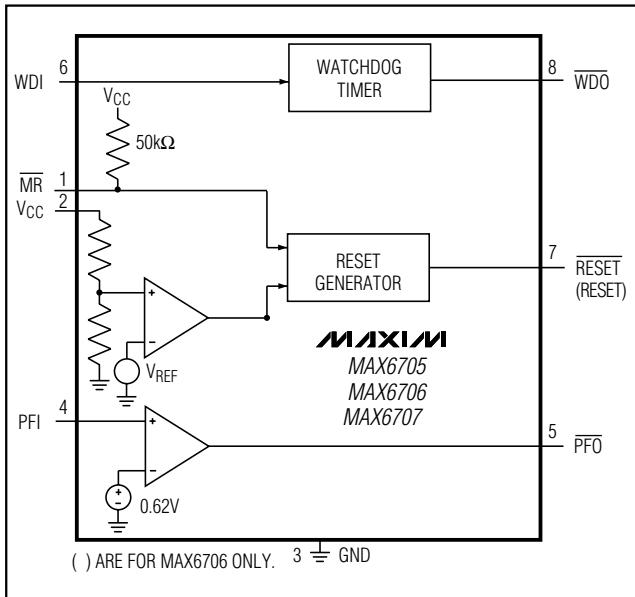


Figure 1. MAX6705/MAX6706/MAX6707 Block Diagram

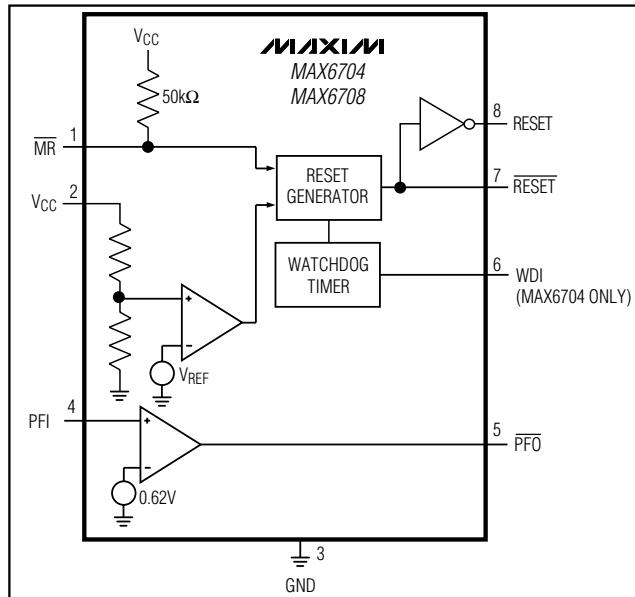


Figure 2. MAX6704/MAX6708 Block Diagram

The MAX6702/MAX6704/MAX6706/MAX6708 active-high RESET output is simply the complement of the RESET output, and is guaranteed to be valid with VCC down to 1V. (See Figure 4.)

## Watchdog Timer

The MAX6701–MAX6707 watchdog circuit monitors the µP's activity. If the µP does not toggle the watchdog input (WDI) within 1.6s, WDO goes low. When RESET is asserted, the watchdog timer stays cleared and does not count. As soon as reset is released, the timer will start counting. WDO deasserts after a valid transition is detected at WDI. Pulses as short as 50ns can be detected.

Typically, WDO will be connected to the nonmaskable interrupt (NMI) input of a µP. When VCC drops below the reset threshold, WDO will go low whether or not the watchdog timer has timed out yet. Normally this would trigger an NMI, but RESET goes low simultaneously, and thus overrides the NMI.

The MAX6704 watchdog circuit does not have an independent watchdog output (WDO). If the µP does not toggle the watchdog input within 1.6s, the MAX6704 will assert a reset output pulse for the reset timeout period. (See Figure 5.)

## Manual Reset

The manual reset input (MR) allows reset to be triggered by a pushbutton switch. The switch is effectively

debounced by the reset pulse width. MR is CMOS logic compatible, so it can be driven by an external logic line. MR can be used to force a watchdog timeout to generate a reset pulse in the MAX6701–MAX6708. Simply connect WDO to MR.

## Power-Fail Comparator

The uncommitted power-fail comparator can be used for various purposes because its noninverting input and output are externally available. The inverting input is internally connected to a 0.62V reference. To build an early warning circuit for power failure, connect the PFI pin to a voltage divider (see *Typical Operating Circuit*). Choose the voltage-divider ratio so that the voltage at PFI falls below 0.62V just before the regulator drops out. Use PFO to interrupt the µP so it can prepare for an orderly power-down. The low input current at this pin allows for large resistor values in the divider.

## Reset-In Information

The MAX6701/MAX6702/MAX6703 include two adjustable reset inputs for monitoring up to a total of three system voltages (including VCC). The thresholds for the monitored RST\_IN supplies are externally set with resistor-divider networks (Figure 6). The reset output is asserted if any of the monitored supplies (VCC, RST\_IN1, or RST\_IN2) go below its specified threshold and remain asserted for the reset timeout period after all supplies are above their thresholds.

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

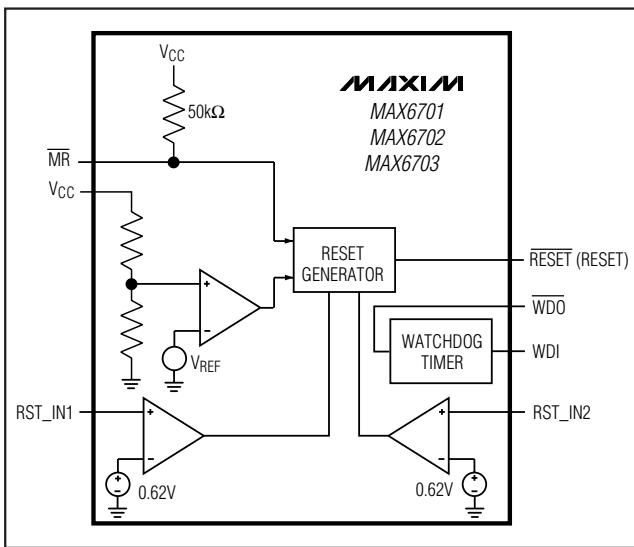


Figure 3. MAX6701/MAX6702/MAX6703 Block Diagram

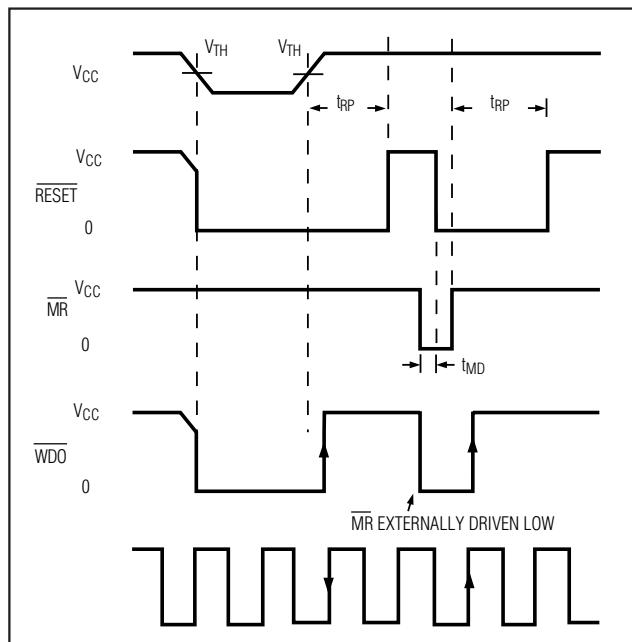


Figure 4. MAX6705/MAX6706/MAX6707 RESET, MR, WDO, and WDI Timing. The MAX6706 RESET output is the inverse of the RESET shown.

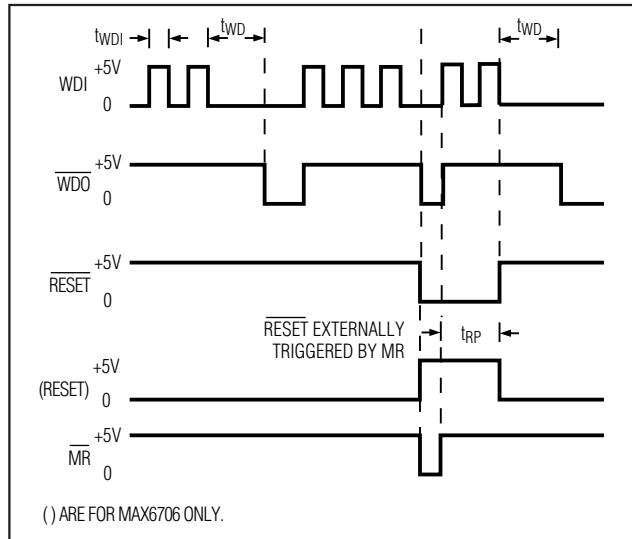


Figure 5. MAX6705/MAX6706/MAX6707 Watchdog Timing

**Ensuring a Valid RESET Output Down to  $V_{CC} = 0$**

When  $V_{CC}$  falls below 1V, the MAX6701–MAX6708 RESET output no longer sinks current—it becomes an open circuit. High-impedance CMOS logic inputs can drift to undetermined voltages if left undriven. If a pull-down resistor is added to the  $\overline{RESET}$  pin as shown in Figure 7, any stray charge or leakage currents will be drained to ground, holding  $\overline{RESET}$  low. A resistor value ( $R_1$ ) is not critical; 100k $\Omega$  is large enough not to load  $\overline{RESET}$  and small enough to pull  $\overline{RESET}$  to ground. This application works for push-pull output only (not for open-drain resets).

## Monitoring Other System Voltages

Other systems can be monitored by connecting a voltage divider to PFI and adjusting the ratio appropriately. In noisy systems, a capacitor between PFI and GND will reduce the power-fail circuit's sensitivity to high-frequency noise on the line being monitored. Reset can be asserted on other voltages in addition to the  $V_{CC}$  supply line. Connect PFO to MR to initiate a reset output pulse when PFI drops below 0.62V. Figure 8 shows the MAX6701–MAX6708 configured to assert a reset output when the secondary supply falls below the reset threshold.

# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

**MAX6701-MAX6708**

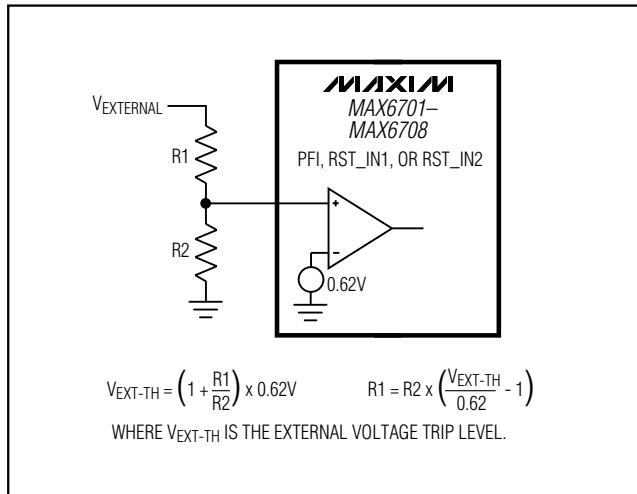


Figure 6. Calculating Adjustable Voltage Thresholds

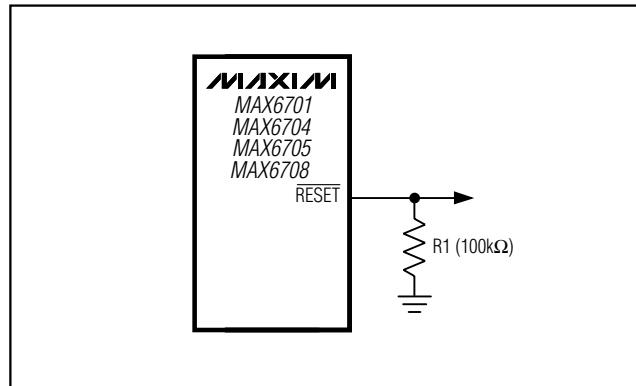


Figure 7. RESET Valid to Ground Circuit

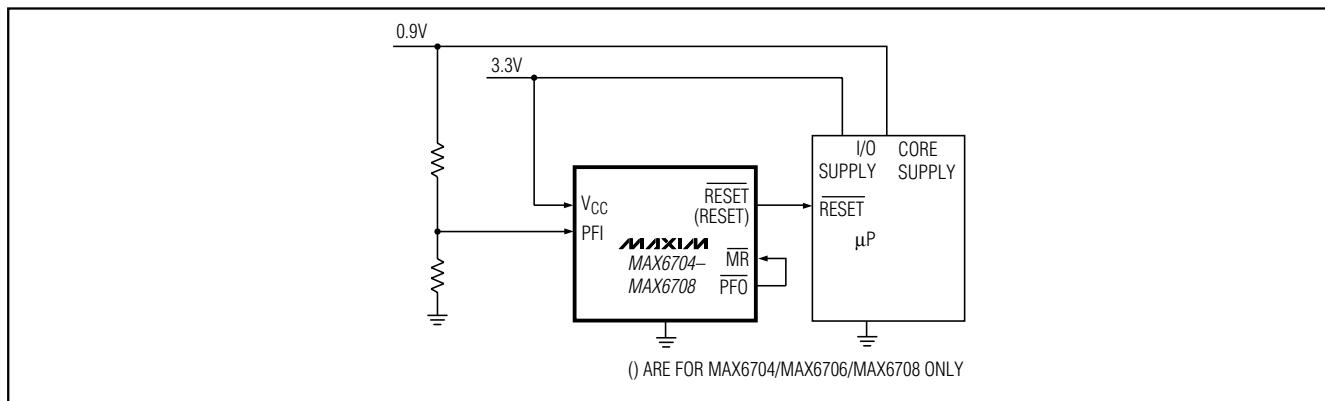


Figure 8. Monitoring Other System Voltages

## Threshold Suffix Guide

| SUFFIX   | RESET THRESHOLD (V) |
|----------|---------------------|
| <b>L</b> | 4.63                |
| M        | 4.38                |
| T        | 3.08                |
| <b>S</b> | 2.93                |
| <b>R</b> | 2.63                |
| Z        | 2.32                |
| Y        | 2.19                |

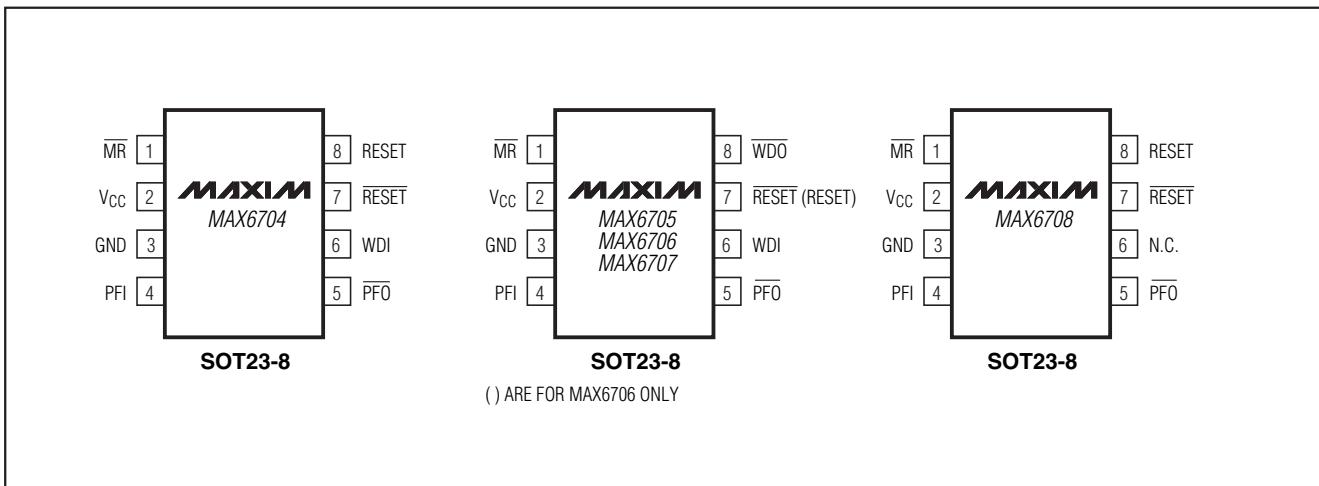
*Bold* indicates standard version.

## Ordering Information (continued)

| PART                | TEMP. RANGE     | PIN-PACKAGE |
|---------------------|-----------------|-------------|
| <b>MAX6704_KA-T</b> | -40°C to +125°C | SOT23-8     |
| <b>MAX6705_KA-T</b> | -40°C to +125°C | SOT23-8     |
| <b>MAX6706_KA-T</b> | -40°C to +125°C | SOT23-8     |
| <b>MAX6707_KA-T</b> | -40°C to +125°C | SOT23-8     |
| <b>MAX6708_KA-T</b> | -40°C to +125°C | SOT23-8     |

## Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

### Pin Configurations (continued)



### Selector Guide

| PART    | RESET<br>PP-LOW | RESET<br>PP-HIGH | RESET<br>OD-LOW | WDI | WDO  | PFI,<br>PFO | RST_IN1,<br>RST_IN2 |
|---------|-----------------|------------------|-----------------|-----|------|-------------|---------------------|
| MAX6701 | ✓               |                  |                 | ✓   | ✓ PP |             | ✓                   |
| MAX6702 |                 | ✓                |                 | ✓   | ✓ PP |             | ✓                   |
| MAX6703 |                 |                  | ✓               | ✓   | ✓ OD |             | ✓                   |
| MAX6704 | ✓               | ✓                |                 | ✓   |      | ✓ PP        |                     |
| MAX6705 | ✓               |                  |                 | ✓   | ✓ PP | ✓ PP        |                     |
| MAX6706 |                 | ✓                |                 | ✓   | ✓ PP | ✓ PP        |                     |
| MAX6707 |                 |                  | ✓               | ✓   | ✓ OD | ✓ OD        |                     |
| MAX6708 | ✓               | ✓                |                 |     |      | ✓ PP        |                     |

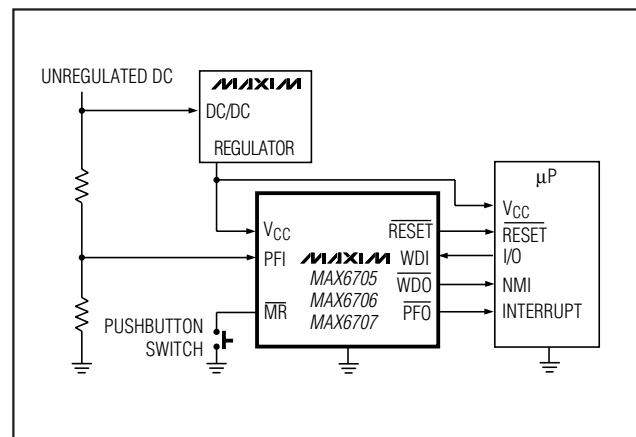
PP = Push-Pull OD = Open-Drain

### Chip Information

TRANSISTOR COUNT: 716

PROCESS: BiCMOS

### Typical Operating Circuit

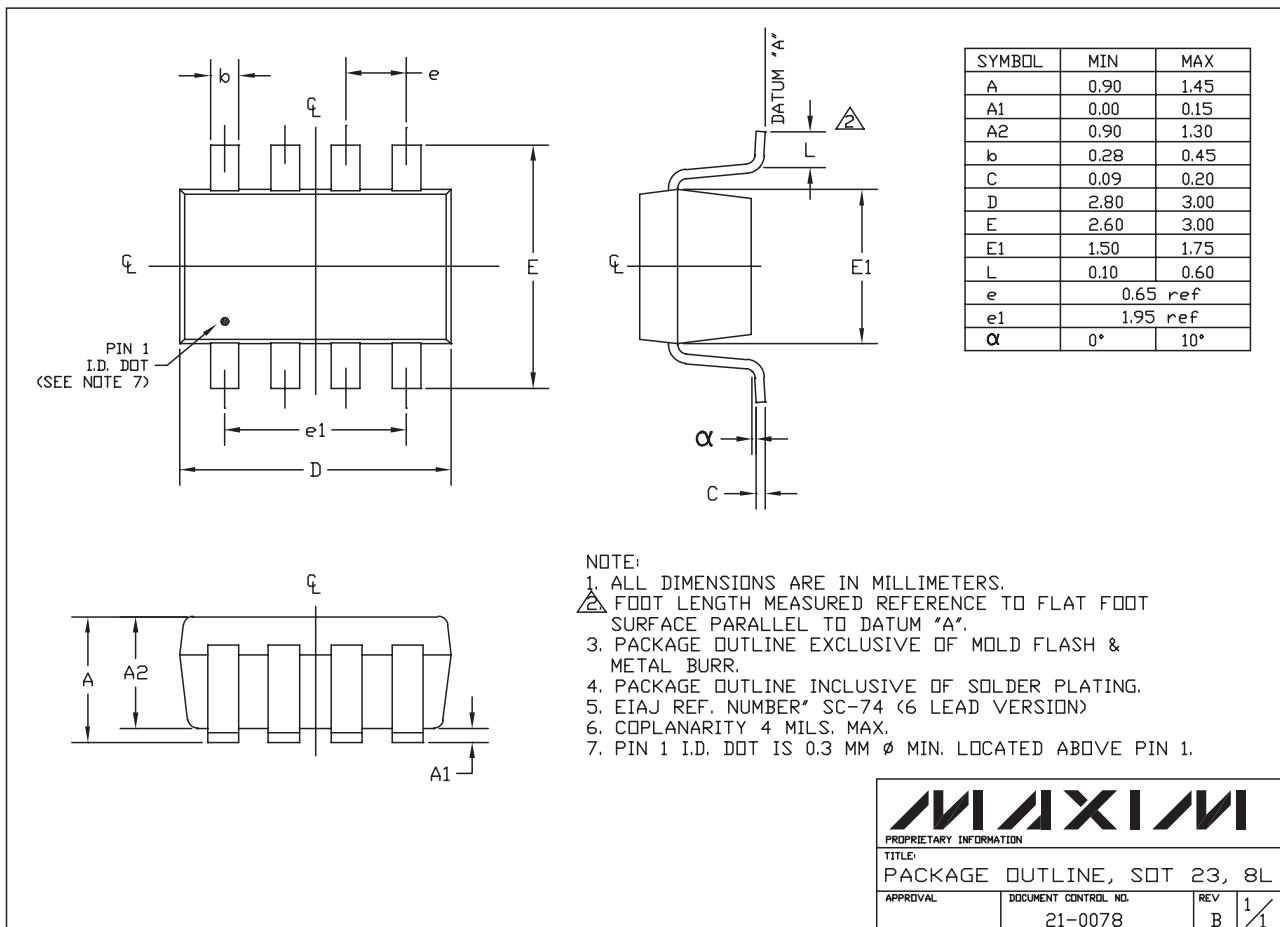


# Low-Voltage, SOT23 µP Supervisors with Power Fail In/Out, Manual Reset, and Watchdog Timer

## Package Information

**MAX6701-MAX6708**

SOT23\_8L.EPS



Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

**Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600**

11